Testimony of

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"Expanding Hawaii's STEM Pipeline: Examining Opportunities to Grow Small Businesses, Entrepreneurs, and the STEM Workforce"

Good afternoon, Senator Hirono, and to those in the audience today. My name is Sylvia James, and I am the National Science Foundation (NSF) Director for the Division of Human Resource Development within the Directorate for Education and Human Resources (EHR).

NSF's mission is "to promote the progress of science; to advance the national health, prosperity, and welfare; [and] to secure the national defense…" NSF's goals – discovery, learning, research infrastructure and stewardship – provide an integrated strategy to advance the frontiers of knowledge, cultivate a world-class, broadly inclusive science and engineering workforce, build the nation's research capability through investments in advanced instrumentation and facilities, and support excellence in science and engineering research and education. I welcome this opportunity to highlight NSF's investments in STEM education, inclusion, and opportunities in the state of Hawaii.

The STEM Participation Challenge

I note that the primary purpose of the Senator's STEM Opportunities Act of 2016 is "to ensure that Federal science agencies and institutions of higher education receiving Federal research and development funding are fully engaging the entire national talent pool."

Also, the Senator's STEM Booster Act is designed "to increase the participation of historically underrepresented demographic groups in science, technology, engineering, and mathematics education and industry."
NSF fully supports these goals and is working hard to achieve them.

The Committee on Equal Opportunity in Science and Engineering, or CEOSE, is a Congressionally-mandated body that meets 3-4 times per year to advise NSF on its broadening participation effort. In its 2011-2012 biannual report to Congress, it recommended, and I quote, that:

"NSF implement a bold new initiative, focused on broadening participation of underrepresented groups in STEM, similar in concept and scale to NSF's centers, that emphasizes institutional transformation and system change; collects and makes accessible longitudinal data; defines clear benchmarks for success; supports the translation, replication and expansion of successful broadening participation efforts; and provides significant financial support to individuals who represent the very broadened participation that we seek."

NSF INCLUDES is our response to that challenge!

NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES) is a comprehensive initiative to enhance U.S. leadership in science and engineering discovery and innovation by proactively seeking and effectively developing STEM talent from all sectors and groups in our society.

Diversity – of thought, perspective, and experience – is essential for excellence in research and innovation in science and engineering in the 21st century. Full participation of all of America's STEM talent is critical to the advancement of science and engineering for national security, health, and economic competitiveness.

The long-term goals of NSF INCLUDES are to fund new research, models, networks, and partnerships that lead to measureable progress at the national level and an ability to scale the concepts of diversity and inclusion in STEM. This will be achieved, in part, by increasing coherence and leveraging synergies across the NSF Broadening Participation (BP) Portfolio – a portfolio we've been developing for many years at NSF.

- There is a wealth of commitment, experience, and knowledge in our current BP Portfolio.
- NSF's investments in the science of broadening participation are key resources.
- NSF INCLUDES will leverage the current BP Portfolio through:
    - Supplements, new program tracks, and Dear Colleague Letters
    - Partnerships with NSF INCLUDES Alliance leaders and organizations

NSF INCLUDES is designed to mobilize the STEM communities to bring renewed focus to solving BP challenges such as under-preparation and lack of opportunity for members of all demographic groups to learn meaningful, relevant STEM content; under-resourcing as seen in growing disparities of access to quality learning and technology across groups; and under-production of STEM graduates from many groups.

In addition to being responsive to the CEOSE 2011-2012[1] and 2012- 2013[2] Biennial Reports to Congress recommendations for a bold investment to move the needle for broadening participation in the STEM workforce, NSF INCLUDES will be customized, as needed, to specific diversity challenges in disciplines identified by directorate advisory committees and reports from national disciplinary societies.

FY16 and FY17 plans

- In FY 2016, NSF issued a call for proposals to fund NSF INCLUDES Launch Pilots, spanning two years of activity for a total of up to $300,000 each for as many as 30 to 40 pilot projects. Teams will be charged to develop plans for a collective impact-type approach to solving a key BP challenge that has the potential to be scaled up and broadly disseminated.

- Nearly 600 proposals from across the country were received during the preliminary phase. Proposals were received from all 50 states and several territories; full project proposals were invited from institutions and organizations in 38 states.

- Also in FY 2016, a series of activities, including workshops and conference proposals will be funded to identify the necessary components of the NSF INCLUDES Backbone Organization[3].

- Calls for proposals to build the NSF INCLUDES National Network will be issued in late FY 2016 for funding in FY 2017. NSF anticipates three tracks in this call: one for NSF INCLUDES Backbone Organization activities; one for NSF INCLUDES Alliances; and one for a second round of NSF INCLUDES Launch Pilots.

- Evaluation will be driven by a focus on the collective goals and on the design of indicators and measures for tracking collective progress toward achieving them.

I have only highlighted one major initiative underway at NSF focused on leveraging the diversity of our STEM workforce. There are many others which I know the Senator is familiar with, including the ADVANCE program, which promotes women in STEM fields in higher education; the Presidential awards for teaching, mentoring and early career achievements; the Tribal Colleges and Universities Program (TCUP); and the Advanced Technological Education Program (ATE), which works with two-year colleges to focus on the education of technicians for high-technology fields.

[1] www.nsf.gov/od/oia/activities/ceose/reports/Full_2011-2012_CEOSE_Report_to_Congress_Final_03-04-2014.pdf
[2] www.nsf.gov/od/oia/activities/ceose/documents/2013-2014%20CEOSE%20Biennial%20Report%20to%20Congress_Final%20Version_09-08-2015.pdf
3 http://www.nsf.gov/pubs/2016/nsf16081/nsf16081.jsp

Hawaii Success Stories

At this point I'd like to mention some exciting success stories here in Hawaii. NSF has awarded more than $40 million annually to entities in Hawaii in recent years, and there are many partners across the state supporting innovation in our STEM workforce.

Award Abstract #1102524

Islands of Opportunity Alliance: Louis Stokes Alliance for Minority Participation
University of Hawaii Hilo, Donald Straney (Principal Investigator)

IOA-LSAMP is an NSF program that works to increase the amount of underrepresented minority students graduating with four-year degrees in STEM disciplines. UH Hilo serves as the lead institution in the IOA and along with 17 alliance partner institutions.

The Islands of Opportunity Alliance (IOA) was established in November 2006 to enlarge the pathway to STEM success. There is evidence that the Alliance has had marked initial success in increasing the numbers of students declaring STEM majors, and initial data reveal that considerable progress has been made in increasing matriculation to four-year institutions and attainment of baccalaureate degrees.

The Pacific region, including Hawaii, spans a vast geographic area that is of strategic, cultural, and economic importance to the United States. Pacific peoples are an important resource with the potential for greater contributions in scientific and economic growth of the region and nation. The increased numbers of Pacific Islander citizens with STEM degrees will serve as a model for other indigenous groups to likewise increase recruitment and retention in the STEM disciplines.

Award Abstract #1345247

Understanding Biotic Response to Environmental Change in Tropical Ecosystems through a Place-Based Context (CREST)
University of Hawaii at Hilo, Donald Price (Principal Investigator)

With NSF support, the UH Hilo (UHH) will further develop the Center for Tropical Conservation Biology and Environmental Science (TCBES) and pursue research focused on enhancing the understanding of biotic response to environmental change in tropical ecosystems through a place-based context. The Center integrates detailed ecological, evolutionary, and genomic research with bioinformatics analysis and Geographic Information Systems modeling. The Center will train the next generation of scientists and professionals, particularly from Native Hawaiian and Pacific Islander communities, with the interdisciplinary perspective that is required to both study and effectively steward the spectacular yet fragile ecosystems found throughout the region. The Center will become a fully established, self-sustaining locus of research and training and grow a first-of-its-kind Ph.D. program in TCBES fields, capable of advancing state-of-the-art research and training in evolution, ecology and genomics.

Award Abstract #1551502

Exploring Ways to Transform Teaching Practices to Increase Native Hawaiian Students' Interest in STEM

University of Hawaii, Pauline W. U. Chinn (Principal Investigator)

The Discovery Research K-12 program seeks to significantly enhance the learning and teaching of science, technology, engineering and mathematics by PreK-12 students and teachers through research and development of innovative resources, models and tools. This project will integrate Native Hawaiian cross-cultural practices to explore ways to help teachers know about and know how to connect resources of students' familiar worlds to their science teaching. This research is needed since Native Hawaiians are often stereotyped as poor learners; the available STEM workforce falls short of meeting the demands of STEM employers in the state; and as the largest group of public school enrollees, data show a greater decline in percent of these students meeting or exceeding proficiency in science at higher grade levels. This project will address these issues by transforming the ways teachers orient their teaching at the upper elementary and middle grades through professional development courses offered at the University of Hawaii at Manoa.

The professional development model for teachers will be situated in the larger national and global contexts of an increasingly technology oriented, urbanized society with associated marginalization of indigenous people whose traditional ecological knowledge and indigenous languages are often overlooked. Guided by the cultural mental model theory and a mixed methods approach, data will be collected through document analysis, surveys, individual and focus group interviews, and pre-post assessments. This approach will capture initial findings about the influence of the professional development model on teaching and learning in science. The end product from this project will be an improved professional development model that is more sensitive to contexts that promote learning by Native Hawaiian students. This project will also produce a survey instrument to assess the interest and engagement in science learning of students whose teachers will have participated in the professional development model being explored. Both outcomes will potentially be instrumental in changing the way approximately 2000 Native Hawaiian students learn about and become more interested in STEM fields through their natural world.

Award Abstract #1516178

Addressing the Need for Women and Minorities in Cybersecurity: A High School Early Admit Study

University of Hawaii, Debra Nakama (Principal Investigator)

The "Addressing the Need for Women and Minorities in Cybersecurity: A High School Early Admit Study" at the University of Hawaii Maui Community College will investigate ways to increase the number of women and minority high school students in cybersecurity. The project will create an early-admit afterschool career pathway for students in grades 11 and 12 that leads to a Cybersecurity Certificate of Completion. The goal will be to motivate students to pursue jobs ranging from basic Computer Support Specialist through advanced level positions in Information Assurance. The project will be implemented in a rural setting where high schools often lack the institutional capital to offer information, technology and computer science

programs. This project will investigate what high school women and minority students need to succeed in information security professions. Moreover, the project will identify factors that affect high school students' cybersecurity career interests. The project specifically targets young women and minorities who live in rural areas in Maui County Hawaii, without ready access to technology. The project will be unique in that it focuses on cybersecurity issues that are critical for small businesses, an often-overlooked segment of the national economy.

This project will be based on an economic model in which early-admit afterschool programs present a viable option for high school students to signal their college/career preferences. The project will engage more than 70 underrepresented high school students with core topics in cybersecurity: (1) participation in a combined problem-based learning (PLB) and game-based learning environment; (2) involvement in hands-on cybersecurity competitions; (3) connection to appropriate college academic and financial aid advising; (4) engagement with community mentors. The project aims to have at least 80% of the targeted participants complete all stages of the career pathway. At least 30% of the participants will be women and Native Hawaiians and Pacific Islanders. The goal of this project is to develop a model that can be replicated in other rural communities to broaden participation for historically underrepresented students by extracting and addressing key factors that are important determinants for high school women and minority students' cybersecurity career/job interests. The project will also develop and train faculty and community mentors as part of faculty-industry teams who will be in positions to disseminate cybersecurity technician education.

Award Abstract #1542764

Broadening Participation of Native Hawaiians for Engineering Faculty Careers
University of Hawaii, Jingjing Li (Principal Investigator)

This project is focused on developing an integrated educational model that will motivate Native Hawaiian graduate students to seek academic careers. Native Hawaiians are significantly underrepresented in the STEM workforce, even more than other racial and ethnic minorities. Native Hawaiians comprise 23% of the state's population, but only 12.8% of the student body and 3.8% of the faculty. More compelling is that of the 1500+ STEM faculty, only 4 are Native Hawaiian. To encourage more Native Hawaiian students to pursue engineering and other STEM fields, role models have a highly visible role, particularly within the educational environment. A diverse faculty provides a rich learning experience for the student as well as significantly enhancing the research enterprise through diversity of thoughts and ideas.

This project will gather information from the Native Hawaiian students and community, utilizing surveys and interviews to research and understand why students are not likely to pursue engineering graduate studies. Using the results, the team will develop a model to provide teaching and research experiences as a pathway to an academic career. The research projects will be focused on the Pacific region, thus enhancing their relevance to the students. A mentoring program will be implemented utilizing engineering faculty and a virtual network that evolves from the establishment of a national Society for Native Hawaiians Engineers. The intellectual merit of this activity is the identification of what might be responsible for impeding the enrollment of Native Hawaiians in engineering graduate studies and their academic/professional careers. The results will enable the development and implementation of interventions that will

increase the numbers of Native Hawaiians in all academic levels of engineering. The broader impact of the project is the formation of a national Society for Native Hawaiian Engineers, which will be instrumental in disseminating the results of the efforts.

Award Abstract #1601119

NSF-ATE: Partnership for Advanced Marine and Environmental Science Training for Pacific Islanders
University of Hawaii, Robert Richmond (Principal Investigator)

The Pacific Islands are an exceptional natural laboratory, with highly diverse and unique coral reef and terrestrial ecosystems that are already under elevated levels of stress and degradation due to the effects of changing global environmental conditions, development pressures, and the effects of overfishing and coastal pollution. The future of the Islands and their populations depends on the technical skills and knowledge available to local resource managers, policy makers and stakeholders. This project will provide critical access to accurate and adequate technical information to strengthen the capacity of the local institutions of higher education. Input from local agencies, businesses and stakeholders have identified key technological skills needed by community college graduates to fill positions within the governments, non-governmental organizations, and in the community and private sector. These students will develop strong STEM-related skills so that they may enter the U.S. mainland workforce in technology-related fields and successfully pursue 4-year and graduate degrees.

This project will enhance marine and environmental science education at the five minority-serving community colleges of the Pacific Islands: American Samoa Community College, the College of Micronesia - FSM, the College of the Marshall Islands, Northern Marianas College, and Palau Community College. The project will support relevant curriculum development; the professional development of the college faculty; internships and field experiences for students; and will also strengthen the scientific infrastructure of the participating institutions. The focus will be on island ecosystems and climate science, and activities will include advanced training for faculty to modernize their courses, expanded use of new tools and technologies, and support for student internships and research experiences.

Conclusion

I applaud the Senator and Committee for holding a hearing on this very important topic and for her appreciation for the need for Hawaii and our nation to continue to invest in long-term, fundamental, and game-changing research in order to keep us competitive. With robust, sustained support for research and education in both the executive and legislative branches, as well as partnerships such as those on display here in Hawaii, NSF contributes to the protection of our national security, the continued development of our workforce, and the enhancement of our economic prosperity.

This concludes my remarks. I would be happy to answer any questions at this time.

Biographical Sketch

Dr. Sylvia M. James is the Director of the Division of Human Resource Development (HRD) in the National Science Foundation's (NSF) Directorate for Education and Human Resources (EHR). The mission of HRD, as exemplified by its seven longstanding programs, is to contribute to the creation of "…a well-prepared and competitive workforce of scientists, technicians, engineers, mathematicians, and educators that reflects the diversity of the U.S. population."

As Division Director, she oversees a $148 million budget and a talented team of scientific and administrative staff. During her 15 year tenure at NSF, she has served as the Acting Division Director of the Division of Human Resource Development, Acting Director and Acting Deputy Division Director of the Division of Research on Learning in Formal and Informal Settings ($221 million budget), Lifelong Learning Cluster Coordinator, and Lead Program Director/Program Director for numerous EHR programs addressing broadening participation in STEM. She currently serves as the Co-Chair of the Federal Coordination in STEM (FC-STEM) Broadening Participation Interagency Working Group, the NSF Liaison to the President's Board of Advisors (PBA) on Historically Black Colleges and Universities (HBCUs), and has been a member of the Burroughs Wellcome Fund, Student Science Enrichment Program (SSEP) Advisory Committee since 2012. She is also a member of the interagency working group for the White House Initiative on Educational Excellence for Hispanics (WHIEEH). She previously served on the Interagency Working Group for Youth Programs (2012-2014) and the 21st Century Community Learning Centers, Interagency Technical Working Group (2011-2014).

Prior to coming to NSF, Dr. James was the Director of Education at the National Aquarium in Baltimore where she was employed for 14 years. She has served as an education consultant for science education radio, youth publications, and museums and an adjunct science faculty member at Sojourner-Douglass College in Baltimore. She is the author of seven children's books on marine animals, in addition to science education publications and reports. Dr. James holds a Bachelor of Science degree in Biology from Loyola University, a Master of Science degree from the Johns Hopkins University, and a Doctorate in Science Education from Morgan State University, all located in Baltimore, Maryland.